

A guitar wire G vibrates at a fundamental frequency of 196 Hz. A second identical wire G' produces 4 beats per second with it when the tension in G is slightly increased. The ratio of the tension in G to the tension in G' is:

- (A) 1.02 (B) 1.04 (C) 1 (D) 1.01

Solution

We have, $v \propto \sqrt{T}$

$$\text{So, } \frac{v_G}{v_{G'}} = \sqrt{\frac{T_G}{T_{G'}}}$$

$$v_G - v_{G'} = 4$$

$$v_G = 4 + 196 = 200 \text{ Hz}$$

$$\text{Now, } \frac{v_G}{v_{G'}} = \frac{200}{196} = \sqrt{\frac{T_G}{T_{G'}}}$$

$$\therefore \frac{T_G}{T_{G'}} = \left(\frac{50}{49}\right)^2 = \left(1 + \frac{1}{49}\right)^2 \approx 1 + \frac{2}{49} = 1.04$$

Hence, (B)